DOCUMENT RESUME

ED 160 549 SP 012 686

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TITLE The Knowledge Gap in Content Areas: A Concern in the Preparation of Elementary Teachers?
PUB DATE 78
NOTE 7p.

EDRS PRICE MF-$0.83 HC-$1.67 Plus Postage.
DESCRIPTORS *Curriculum Development; Education Courses; Effective Teaching; Elementary Education; *Elementary School Teachers; *Knowledge Level; Mathematics Instruction; *Preservice Education; *Teacher Education Curriculum; Teaching Quality; *Teaching Skills

ABSTRACT

Teacher ineffectiveness in elementary education is to a large degree due to inadequate preservice education in content areas, and this should be a concern of teacher educators. Statistical data supports this contention, e.g., 275 of 389 students in a mathematics methods course could not work a simple percent problem. Although some professors would maintain that the task of teacher education is to teach methodology, experience shows that many teachers lack basic understanding of the concepts included in the elementary school mathematics curriculum. Some of the options available for solving the problem were presented in a questionnaire to 51 colleges of education. These suggestions and the percentage of favorable responses for each were: (1) restrictive examinations in content areas before admittance to related methods courses (34%); (2) diagnostic entrance examinations followed by remediation before admittance to related methods courses (59%); (3) prerequisite courses in related content areas (93%); (4) special content courses for elementary education majors (85%); (5) team teaching of the methods courses and/or integrated content and methods courses (52%); (6) competency based programs (71%); (7) methods instructors include content in their methods courses (63%); (8) increased credit hours for methods courses (26%); (9) tutoring services to aid in content mastery (no percentage given); (10) laboratory experiences in classrooms (81%). Whatever the option, colleges of education must address the problem if their curriculum is to be effective in preparing teachers. (DS)

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ED160549

The Knowledge Gap in Content Areas: A Concern in the Preparation of Elementary Teachers?

Are preservice teachers generally knowledgeable enough in the content areas to do an effective job in an elementary school classroom? Is content area knowledge of importance for an elementary teacher? Should the problem of content area knowledge be of concern to Colleges of Education? If this problem does exist, what are some of the options available for solving it? These are some of the questions on which this paper will focus.

Based on the results of research, on interviews with persons in the field of elementary education, and on my own experience, it is my belief that this one factor is responsible for a considerable amount of teacher ineffectiveness and thus must be a concern of teacher educators. When I first attempted to explain the extent of this deficiency in the area of mathematics to others, I often found that many either did not understand the seriousness or that they simply questioned the validity of my assessment of the deficiency. The science methods teachers sometimes agreed that they too sensed a knowledge gap in the content area on the part of students, and some social studies methods instructors also agreed that the problem existed but replied that they were at a loss to know what to do about it.

In an attempt to document the seriousness and extent of this problem, I standardized the diagnostic examination which I administer on the first day of class to each section of my

SP012 686

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mathematics methods classes and began to accumulate this data. At the end of the fourth year, a total of 389 tests were available. Approximately 20% of these students held Bachelor's degrees, and some were already teaching at the time that they took the course. 75% of these students were transfers from other colleges and universities representing a variety of academic backgrounds. Over 95% had completed at least one college mathematics course. The examination consisted of 72 items; however, including the results of six items here will give an indication of the situation.

1. Whole number subtraction with four digits - 67% correct
2. Whole number multiplication with three digits - 57% correct
3. Subtraction of fractions - 41% correct
4. Subtraction of decimal fractions - 54% correct
5. Finding the percent of a whole number - 29% correct
6. Explaining the symbol for "less than" - 59% correct

Stating the results negatively highlights them more dramatically. For example, 275 preservice teachers (out of 389) were unable to work a simple percent problem.

If we now grant that some preservice students are lacking in basic mathematical ability, the next question would be to determine whether this knowledge gap will reduce their effectiveness as future classroom teachers. There are a number of professors who feel that the task of teacher education is to teach methodology, and that it is not important for students to know content because they can learn what they need on the job. This might sound reasonable; however, as a supervisor of student teachers,

I am in classrooms every day and am aware of what teachers know and learn. I find an alarming number who do not have a basic understanding of the concepts included in the elementary school mathematics curriculum, and I observe them disbursing incorrect processes and terminology, and confused and inefficient procedures not based on sound mathematical principles.

If we were to accept this problem as an area of our responsibility, what are some of the options available in solving it? To supplement my informal research on this topic, during the fall of 1977, I formulated a questionnaire which was mailed to fifty-one colleges of education in thirty-five states. I received a 60% return and will indicate in parenthesis following each option the percent indicating that they now require it or that they would recommend the option as a possible solution to this problem. Only 19% indicated that they did not experience a lack of knowledge in content areas in their preservice teachers.

1. Restrictive examinations in content areas before admittance to related methods courses. (34%)

This might prove especially helpful in areas such as mathematics where there is a reasonable amount of basic information that could be used in such test construction.

2. Diagnostic entrance examinations followed by remediation before admittance to related methods courses. (59%)

The political implications and accompanying involvement of any type of restrictive examinations in universities today obviously are serious considerations. There is also the very real problem of enrollment declines. Convincing faculty members who are not cognizant of the necessity for such testing can prove a major

obstacle, also. The major difference between option 1. and 2. is that option 2. attempts to assist the student in contrast to simply rejecting him. Providing the remediation courses can be a financial hardship in some instances.

3. Prerequisite courses in related content areas (93%)
If the Colleges of Liberal Arts provides the content courses, the Colleges of Education can provide the methodology and thus produce effective teachers. In the area of mathematics, however, a course in college algebra is not all that teachers in grade four need in order to help them be effective classroom teachers. Many also need to develop understanding of our system of numeration and a facility in computing whole and rational numbers, for example. These competencies are usually assumed in college mathematics content classes and thus not taught. As a result, some students become even more confused and frustrated while taking the college content course and arrive in the methods classes frightened and hostile toward all mathematics. Many of these students request a student teaching placement with the primary grades hoping to be able to cope with second grade arithmetic. They carry their attitude of fear and dislike of mathematics into the classrooms and perpet uate it.

4. Special content courses for elementary education majors. (85%)
It is necessary to staff these courses with instructors who have knowledge and experience in elementary education and expertise in the subject area and to insure that this arrangement does not jeopardize the academic status of the elementary education major. In at least one university, these mathematics courses have proven

very popular and are often taken by students other than elementary education majors, also.

5. Team teaching of the methods courses and/or integrated content and methods courses (52%)

Where there is a good working relationship between the Department of Elementary Education and the Mathematics Department, this has proven highly effective.

6. Competency based programs (71%)

The needs of the individuals are diagnosed, and materials are provided to meet them. Passing grades in the courses are dependent upon demonstrating competency in content as well as methods. This option has the advantage of not restricting enrollment as well as that of providing a degree of assurance that students obtain a minimum competency in skills, knowledge, and understanding of the concepts deemed significant for successful teaching.

7. Methods instructors include content in their methods courses (63%)

It would seem difficult to completely divorce methods and content. As soon as the instructor gives an example to demonstrate a technique, content is involved, and with many preservice teachers this content is new and must be learned as the method of teaching is presented. Many methods instructors face this dilemma constantly. Should they stop and explain the content, especially if it is a basic concept absolutely necessary for effective teaching?

8. Increased credit hours for methods courses (26%)

If content must be included in methods courses, then more time will be required for them. It is not reasonable to expect two

courses to be taught in the time limitation of one course. Until the seriousness of the problem is understood and accepted, this option is difficult to promote.

9. Tutoring services to aid in content mastery. This suggestion is used extensively in junior colleges and can be utilized in conjunction with several of the above options.

10. Laboratory experiences in classrooms (81%) Assigning students to classrooms to observe and/or assist in instruction can be motivating and enlightening for the preservice teacher who has deficiencies in content areas. The cooperating teachers would be selected for their proven expertise in content as well as methods.

In summary, I am convinced that many preservice teachers have knowledge gaps in the content areas for which they will have teaching responsibilities. I am also convinced that many classroom teachers do not obtain mastery of this knowledge and that this is a definite detriment to their effectiveness. This must be a concern of Colleges of Education in planning programs to prepare elementary school teachers. The options described in this paper have proven helpful in some institutions; however, further research is needed.